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VOL.5 No. 11 MARCH 18, 1955

Cooperative
ECONOMIC INSECT REPORT

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PLANT PEST CONTROL BRANCH

AGRICULTURAL RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

PLANT PEST CONTROL BRANCH

ECONOMIC INSECT SURVEY SECTION

The Cooperative Economic Insect Report is issued weekly as a service to American Agriculture. Its contents are compiled from information supplied by cooperating State, Federal, and industrial entomologists and other agricultural workers. In releasing this material the Branch serves as a clearing house and does not assume responsibility for accuracy of the material.

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Economic Insect Survey Section
Plant Pest Control Branch
Agricultural Research Service
United States Department of Agriculture
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Volume 5 March 18, 1955 No. 11

COOPERATIVE ECONOMIC INSECT REPORT

Highlights of Insect Conditions

GREENBUG light to heavy in several Texas Panhandle counties. Also widely scattered heavy infestations in north central area of this State, but populations very low in western half of Oklahoma and only one colony found in Kansas. (page 221).

WINTER GRAIN MITE heavy widespread on small grains in some areas of Texas, but low in western Oklahoma. (page 221).

YELLOW CLOVER APHID increasing in southern Arizona. (page 223). Earlier report from Nevada indicated possible problem later in southern area of that State.

Severe damage from SIX-SPOTTED MITE to citrus expected in Florida. (page 223).

Heavy increase of VEGETABLE WEEVIL in tobacco beds at Quincy, Florida. Slight damage to tobacco beds in South Carolina. Adults taken in Maryland. (page 224).

BOLL WEEVIL survival counts from Florence County, South Carolina and Washington County, Mississippi. (page 225).

LIGHT TRAP COLLECTIONS in Florida, Arkansas and Tennessee. (page 227).

Summary of INSECT CONDITIONS - 1954 - in Missouri. (page 230).

SURVEY METHOD for European red mite. (page 241).

GREEN PEACH APHID abundant at Charleston, South Carolina. (page 224).

Map of MORMON CRICKET infestation expected in 1955. (after page 222). See CEIR 5(8) 158 for writeup.

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Reports in this issue are for the week ending March 11, 1955, unless otherwise designated.

WEATHER FOR THE WEEK ENDING MARCH 14, 1955

Duststorms in the Great Plains, tornadoes in the Indiana-Ohio-Pennsylvania area, forest fires in the Southeast, the Ohio River flood, and unseasonably early spring warmth featured the week's weather.

An intense instability line, that formed in the area from Wyoming to New Mexico on the 10th with a depression centered over southeastern Montana moved rapidly eastward attended by strong dust blowing wind of 40 to 60 m. p. h. over the Great Plains. Gusts up to 95 m. p. h. were recorded near Boulder, Wyo. and great clouds of dust were reported extending to a height of 19,000 feet in some areas. The winds caused considerable loss of topsoil and much damage to wheat, in the droughty sections of eastern Colorado, southwestern Kansas, northeastern New Mexico and the Panhandles of Oklahoma and Texas

Severe thunderstorms and a number of tornadoes occurred in the low Lake region and Ohio Valley as the active squall line moved over that area early on the 11th. Tornadoes were reported from east-central Indiana, portions of eastern Ohio, and western Pennsylvania early the 11th, with preliminary newspaper reports of a million dollars damage in each of the three States and two deaths in Pennsylvania.

Numerous forest fires during the week affected thousands of acres in the southern portions of Alabama and Georgia and adjacent areas. Winds and continued warm, dry, sunny weather increased the fire hazard in this critically dry area.

The Ohio River, experiencing the highest flood stages since 1948 during the past 2 weeks, is now receding at all points. Flood peaks ranged from 3 to more than 10 feet above flood stage along portions of the Ohio River and overflows occurred also in tributary streams in Ohio, West Virginia, Kentucky and Indiana.

At the beginning of the week cold weather covered nearly all of the Country, with the lowest temperatures ranging from -31° at International Falls, Minn., on the 7th and -3° at Caribou, Maine, on the 9th to freezing and frosts as far south as the interior of northern Florida, nearly to the Gulf Coast, and along the North Pacific Coast. This was followed by a rapid change to unseasonably early warmth east of the Rockies, establishing new records of the highest temperature for so early in the spring. Among these were 85° at Wichita, Kans., 86° at St. Louis, Mo., 61° at

(Weather continued on page 229).

CEREAL AND FORAGE INSECTS

GREENBUG (Toxoptera graminum) - TEXAS - Infestations on wheat vary from light to heavy in Swisher, Hale, Castro, Deaf Smith, Lipscomb, Hansford, Moore, Hutchinson, Ochiltree and Hemphill Counties. Infestations heaviest in Swisher County with as high as 2,000 greenbugs per foot in spots in one field. Less than one per foot on small grains in Wichita, Childress, Wilbarger, Foard and Hardeman Counties. Widely scattered fields have heavy infestations in spots in north central area, especially in Denton, Wise, Tarrant, Dallas, Rockwall, Hunt, Collin, Cooke, Grayson and Fannin Counties. (Davis, Chada, Daniels, Simonds). OKLAHOMA - Populations very low in the 23 counties in the western half of the State surveyed February 23 - March 6. Found in only 13 of the 143 fields inspected and averaged only 0.3 per linear foot in all fields. (Henderson). KANSAS - None found in areas surveyed in 14 counties in southeastern area, western 3 tiers of counties and in the 16 counties just east of latter area. (Matthew, DePew, Harvey). Wheat and barley examined in 67 counties during past two weeks showed greenbugs only in one field in northern part of Harper County. (Matthew).

BROWN WHEAT MITE (Petrobia latens) - TEXAS - Light local infestation on wheat in Denton, Cooke, Collin, Dallas and Tarrant Counties; medium to heavy in Swisher, Potter, Hutchinson, Hansford, Ochiltree, Lipscomb, Hemphill, Childress, Hardeman and Foard Counties. (Chada, Davis). KANSAS - Populations very low in western area. Highest counts between 6 and 24 mites per 5 feet of row. (DePew). OKLAHOMA - Found in 69 of 143 fields inspected in 23 counties in the western half of the State during February 23 - March 6. Highest populations found in Beaver County with an average of 36 per linear foot in 10 fields inspected. Five fields in the most heavily infested portion averaged 225 mites per linear foot. Fairly high populations in Woodward County (30 per linear foot) and Dewey County (25 per linear foot). As in previous surveys, the only high populations were found in fields planted continuously to wheat. (Henderson).

WINTER GRAIN MITE (Penthaleus major) - TEXAS - Attacking wheat, oats, barley. Heavy widespread infestations in continuously cropped fields, especially in Denton, Cooke, Grayson, Collin, Wise, Tarrant, Dallas, Johnson, Rockwall, Hill, McLennan and Bell Counties in north central and central part of State, and in Kendall, Kerr and Gillespie Counties in the southern area. Control necessary to save grain crops in north central area. (Chada). OKLAHOMA - Found in following counties in western half of State, February 23 - March 6 (figure is number of fields infested): Kingfisher 2, Washita 1, Tillman 4, Kay 1 and Grant 1. Populations were quite low except for 2 fields in Tillman County. (Henderson).

ARMY CUTWORM (Chorizagrotis auxiliaris) - KANSAS - Counts low in wheat fields of most of northwestern and southwestern counties surveyed. Highest count , 8 larvae per 5 linear feet of row. (DePew). OKLAHOMA - Found in 20 of 143 fields inspected in western part of State February 23 - March 6. Highest population in any field was 0.4 per linear foot. Higher populations, up to 5 per linear foot, found on border of wheat land adjoining pasture areas, but even here populations usually quite low. (Henderson).

ENGLISH GRAIN APHID (Macrosiphum granarium) - KANSAS - Of 14 southeastern counties surveyed, this species found only in one wheat field in Montgomery and Elk Counties. Counts average 1-3 wingless adults per 25 sweeps of a 15-inch net. (Matthew). A colony found at one location in each of Finney and Logan Counties. (DePew). ARKANSAS - Spotty infestations of small grains averaging up to 75 per foot of tiller row in east-central area. (Warren).

CHINCH BUG (Blissus leucopterus) - KANSAS - Actively moving about in clumps of bunch grass in the southeast. Active bugs found also in wheat and barley fields in Montgomery and Elk Counties, but counts averaged only 1-3 bugs per 25 sweeps of a 15-inch net. (Matthew).

CONCHUELA (Chlorochroa ligata) - TEXAS - Medium local infestation on small grains in Dimmit County. Infestation was on wheat and barley but now declining. (Richardson).

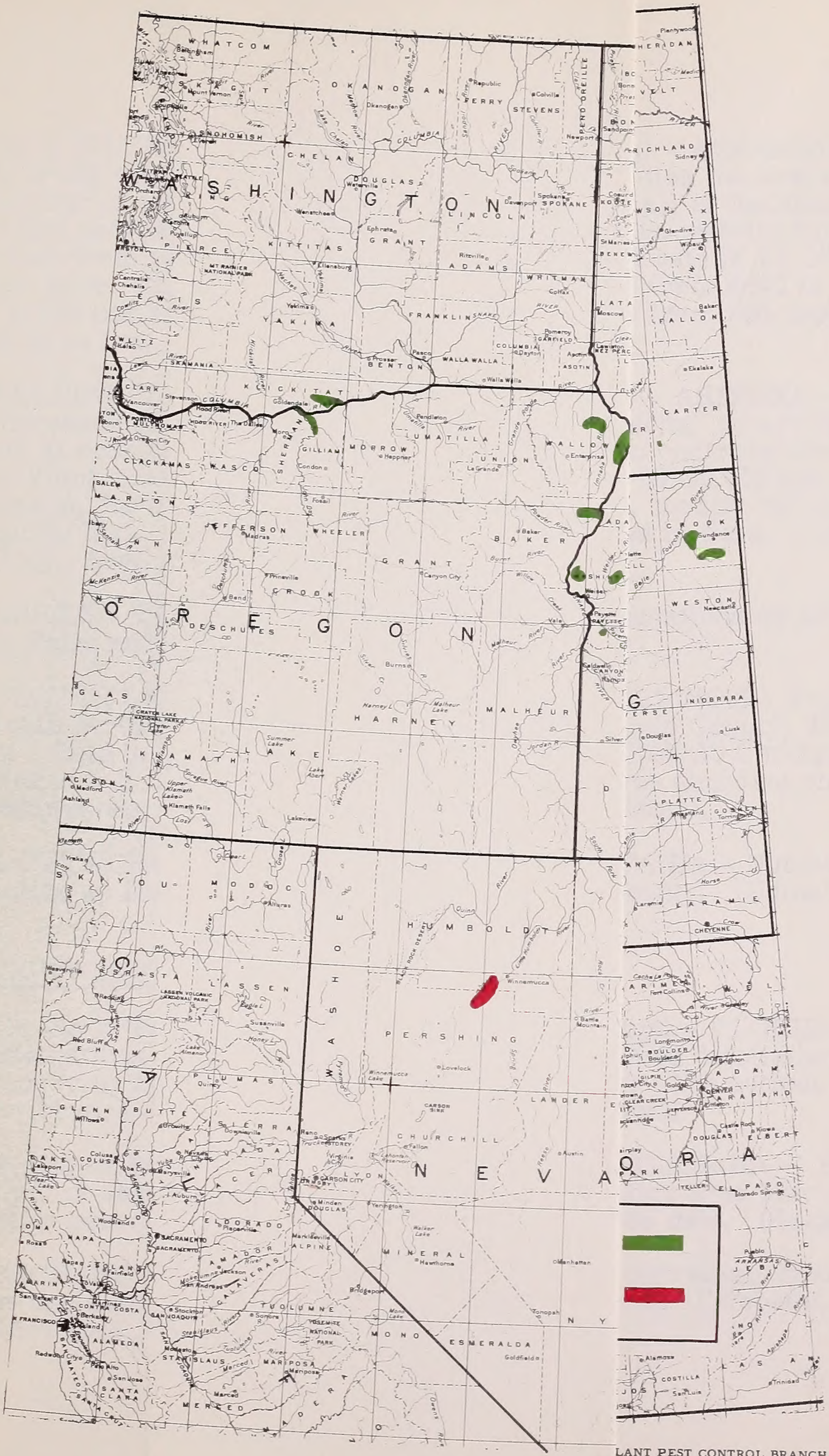
A SPIDER MITE (Tetranychina apicalis) - FLORIDA - Spotted infestations on white clover at Gainesville. Five to 25 per leaf. All stages present. (Kuitert).

CORN FLEA BEETLES - ILLINOIS - Active and feeding in grasses in Champaign County. (Petty, March 2-3).

AN ARMYWORM - TEXAS - Light local infestation on oats in Kaufman County. (Davis, Garner, Randolph).

AN ERIOPHYID MITE (prob. Aceria tulipae) - KANSAS - Abundant in a field of volunteer wheat in southern Osage County. (Matthew).

MORMON CR

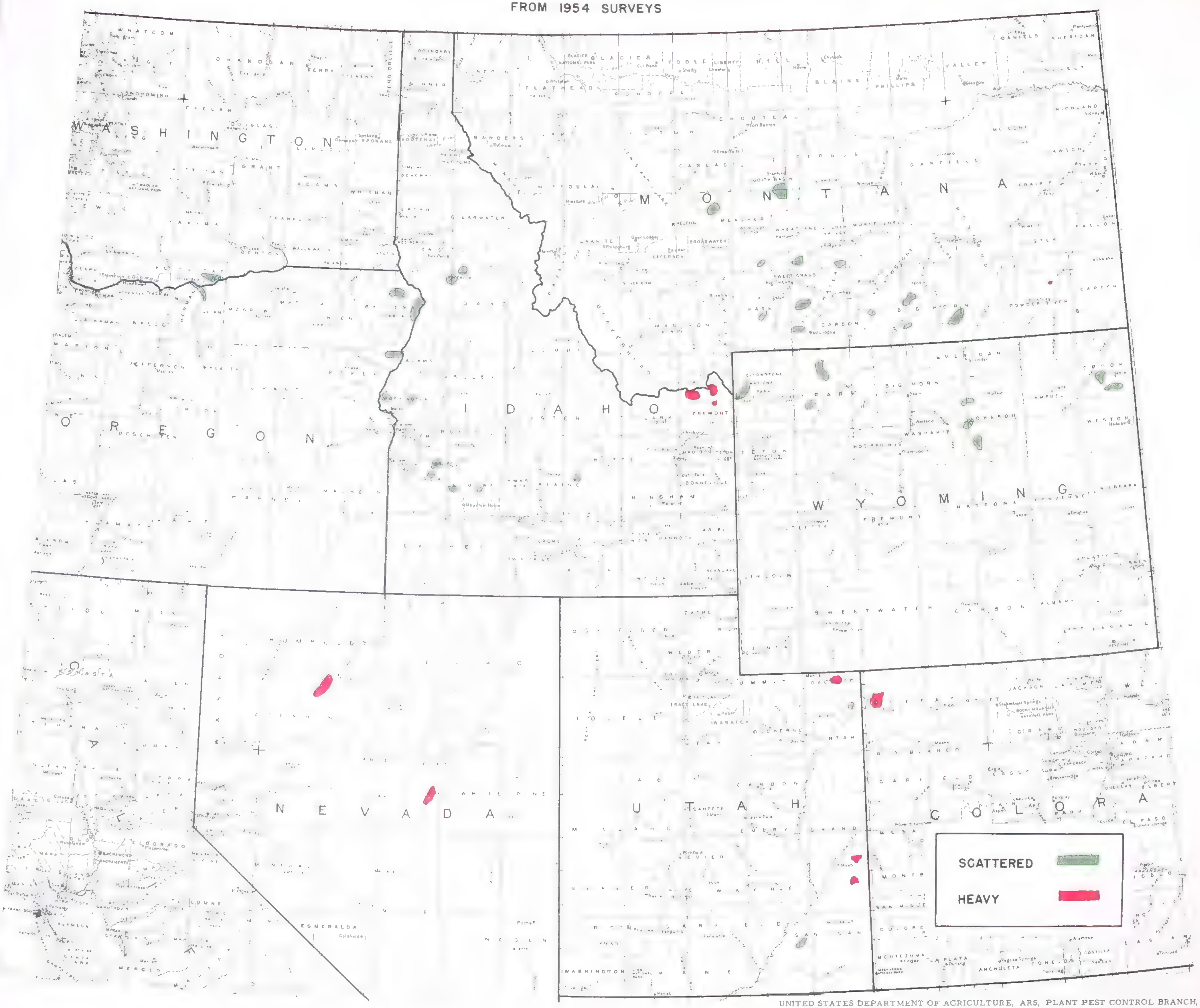


LANT PEST CONTROL BRANCH,
DECEMBER 31, 1954.

GPO 835659

MORMON CRICKET INFESTATION EXPECTED IN 1955

FROM 1954 SURVEYS



UNITED STATES DEPARTMENT OF AGRICULTURE, ARS, PLANT PEST CONTROL BRANCH,
GRASSHOPPER CONTROL PROJECT, DENVER, COLORADO. DECEMBER 31, 1954.

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RICE WATER WEEVIL (Lissorhoptrus simplex) - ARKANSAS - In trash samples processed for hibernation studies the average number of weevils found per acre was 7,913. All of the stubble fields and most of the roadside sites produced no weevils but trash from one roadside site yielded weevils at rate of 12,100 per acre. In trash from woods weevils ranged from 4840 to 72,600 per acre an average of 21,296 per acre from this type of situation. (Warren).

YELLOW CLOVER APHID (Myzocallis trifolii) - ARIZONA - Increased sharply in all areas of southern Arizona, though still not at economic level in some parts. Where no controls used in Yuma area approximately 700 acres, about 50-50 old and new stands, have been lost and about 12,000 acres, mostly old stands, partly lost. No stands lost where controls used in time. (Ariz. Coop. Rept.).

APHIDS - TEXAS - Medium to heavy local infestations on alfalfa in Falls and McLennan Counties. (Parencia).

CLOVER LEAF WEEVIL (Hypera punctata) - ILLINOIS - Four small larvae per square foot in 1 field in Iroquois County, 16.5 in 1 field in Will County and 14.5 in 1 field in DeKalb County. March 2-3. (Petty). PENNSYLVANIA - Larvae abundant on legume hay, March 4, Washington County. (Udine).

A CUTWORM (Agrotis gladiaria) - PENNSYLVANIA - Numbers active on legume hay, March 4, Washington County. (Udine).

FRUIT INSECTS

SIX-SPOTTED MITE (Tetranychus sexmaculatus) - FLORIDA - Infestations continue to increase. In some groves defoliation is occurring and mites being found on new leaves. The outlook is for severe damage. (Pratt, Thompson, Johnson).

PLUM CURCULIO (Conotrachelus nenuphar) - GEORGIA - First adult of season taken on peach tree in Fort Valley area March 1. Hiley peach trees 1 to 5 percent in bloom at this date. (Snapp).

ORCHARD MITES - UTAH - Brown mite eggs extremely numerous on apple and peach trees in some Moab orchards. (Tibbetts, Knowlton).

SPOTTED CUCUMBER BEETLE (Diabrotica undecimpunctata howardi) - SOUTH CAROLINA - On peach in Saluda and Eutawville. Adults damaging peach leaves on about 7 acres. (Sanders).

TRUCK CROP INSECTS

VEGETABLE WEEVIL (Listroderes costirostris obliquus) - SOUTH CAROLINA - Larvae slightly damaging turnips and some young cabbage as well as tobacco in plant beds in some area (Cuthbert, Nettles). MARYLAND - Adults collected on chickweed in St. Marys City, St. Marys County. Det. R. E. Warner. (U. Md., Ent. Dept.). FLORIDA - Averaging 1 to 3 larvae per plant in tobacco plant beds at Quincy. Heavy increase causing all growers to apply control measures. (May).

CABBAGE APHID (Brevicoryne brassicae) - SOUTH CAROLINA - Infestation light to heavy on cabbage with many plantings requiring control in the Charleston area. (Cuthbert). CALIFORNIA - Infestations light in most young cabbage fields, but heavy on some roadside mustard. (Campbell, Mar. 4).

CUTWORMS - CALIFORNIA - A cutworm, probably Peridroma margaritosa, causing considerable injury in cabbage fields in Orange County. Good control obtained. (Campbell, Mar. 4).

APHIDS - GEORGIA - Heavy infestation on 50 acres of cabbage in Brooks County. (Jordan). SOUTH CAROLINA - A root aphid abundant in many turnip fields of the Charleston area. (Cuthbert).

GREEN PEACH APHID (Myzus persicae) - SOUTH CAROLINA - Abundant on spinach in Charleston area. Control required in nearly all plantings. (Cuthbert).

SEED-CORN MAGGOT (Hylemya cilicrura) - SOUTH CAROLINA - Injuring buds of an occasional plant in many spinach plantings in the Charleston area. (Cuthbert).

TURNIP APHID (Rhopalosiphum pseudobrassicae) - SOUTH CAROLINA - Infestations generally heavy on crucifers in Charleston area. (Cuthbert).

SERPENTINE LEAF MINER (Liriomyza sp.) - FLORIDA - Averaging 2 to 3 adults per plant on tomato plants in Dade County Feb. 25. Three (all stages) per bean leaf, 2-3 per potato leaf and 3-4 per tomato plant in this county, March 1. More abundant than at any time during winter. Controls being applied. (Wolfenbarger).

ONION MAGGOT (Hylemya antiqua) - TEXAS - In one field on onions in Dallas County. Apparently in one particular purchase ofonions as not found in others in adjoining fields. (Milikien).

POTATO TUBERWORM (Gnorimoschema operculella) - UTAH - Known distribution in Utah confined to Enterprise, Beryl, Parowan, Paragonah, Cedar Valley, Santa Clara, Modina areas of Washington and Iron Counties. (Hutchings, Knowlton).

STRAWBERRY APHID (Capitophorus fragaefolii) - CALIFORNIA - Building up to damaging numbers, both old and new in strawberry fields of Orange and Los Angeles Counties. Most growers applying insecticides. (Campbell).

THRIPS - ARIZONA - Warrant control in one 50-acre field of onions at Phoenix March 3. (Ariz. Coop. Rept.).

TWO-SPOTTED SPIDER MITE (Tetranychus bimaculatus) - CALIFORNIA - Building up in old strawberry plantings. Numerous enough to require treatment. (Campbell, March 4).

COTTON INSECTS

Boll Weevil Survival Counts:

SOUTH CAROLINA - Surface woods trash examinations for surviving boll weevils were made from Feb. 24 to March 4 in Florence County. The examinations showed live boll weevils at various rates per farm ranging from zero to 15,488 per acre with an average of 2,178 per acre. Although the number of weevils found per acre in the fall examinations in 1954 (2,299) was low compared to the fall of 1953 when 3,533 were found per acre and to a 12-year average of 4,355, the number found in the spring examinations for 1955 (2,178) was more than the number found in the spring of 1954 (1,936). This was due to a winter survival of 94.7 percent for the winter of 1954-55, compared with a survival of 54.7 percent for the winter of 1953-54. Only in three other years (1949, 1950, and 1953) for the period 1942-1955 has a higher percent survival been found.

Following records are on other insects found in these examinations. Fuller rose beetle (*Pantomorus godmani*) survival was only 14.3 percent compared with survival of 94.7 percent for boll weevil. The numbers of bean leaf beetle (*Cerotoma trifurcata*), lady beetles, and spotted cucumber beetles (*Diabrotica undecimpunctata howardi*) found in the spring examinations were low and approximately the same as the number found in the fall examinations. (Walker).

MISSISSIPPI - Ground trash samples for hibernating boll weevils were collected at 5 points in Washington County March 7-8. Examination of these samples showed that the average number of live weevils per acre surviving the winter was 1,646. (Dunnam, Merkl et al). Records of ground trash examinations for Washington County for previous years are not available.

INSECTS AFFECTING MAN AND ANIMALS

MOSQUITOES - FLORIDA - At Gainesville *Culex restuans* averaged over 50 larvae per dip and *C. salinarius* adults have been a biting pest out-of-doors and inside for several days. (Mead). *Aedes* spp. and *Psorophora ferox* were collected by insect net in Alachua County. Of these *A. infirmatus* was the most abundant (80 percent). (Weems, Morse).

HOG LOUSE (*Haematopinus adventicius*) - PENNSYLVANIA - Moderate infestation of hogs in Butler County, March 4. (Adams).

CATTLE LICE - UTAH - Common in San Juan County. Controls underway. (Knowlton, Rudd). Have been quite a problem in Utah County. Total of 35,000 head of cattle will be treated one or more times. (James, Knowlton).

COMMON CATTLE GRUB (*Hypoderma lineatum*) - GEORGIA - Infestation in scalp of human in Atlanta. Larvae apparently migrated from chest area to scalp before emerging. (Blasingame).

BLACK WIDOW SPIDER (*Latrodectus mactans*) - MARYLAND - Four found under a stone in a yard in Silver Spring. (Sherman).

POULTRY BUG (*Haematosiphon inodorus*) - ARIZONA - Reported invading schoolhouse 30 miles east of Kingman and biting the children. (Ariz. Coop. Rept.).

FOREST, ORNAMENTAL AND SHADE TREE INSECTS

NANTUCKET PINE MOTH (Rhyacionia frustrana) - MARYLAND - Heavily infesting 109 red pines in Baltimore County. Pupae present. (U. Md., Ent. Dept.).

BENEFICIAL INSECTS

MITES - KANSAS - Numerous grasshopper mites, probably Eutrombidium trigonum, in an alfalfa field in Labette County. Found under and in grass clumps along a hedge row. (Matthew).

MISCELLANEOUS INSECTS

AN ANT (Tapinoma melanocephalum) - FLORIDA - Adults extremely active (some established colonies) in building at Gainesville. This species usually confined to southern section, and is a new record for this area. (Hetrick).

CLOVER MITE (Bryobia praetiosa) - TENNESSEE - Infesting homes in scattered areas across State. (Mullett).

A BARK BEETLE (Hylastes sp.) - PENNSYLVANIA - Pine flooring laid over cement floor severely damaged, in house in Westmoreland County. (Udine).

Light Trap Collections:
FLORIDA - Some of the more important insects collected in light trap at Homestead between January 31 - February 7 include the following: Nezara viridula 3, Agrotis ypsilon 7, Estigmene acrea 1, Etiella zinckenella 3, Feltia subterranea 3, Laphygma frugiperda 1, Mocis latipes 14, Peridroma margaritosa 1, Prodenia eridania 2, P. dolichos 6, P. ornithogalli 2, Pseudaletia unipuncta 3. (Wolfenbarger). Collections at Gainesville February 3-7 contained 1 Prodenia ornithogalli. (Denmark).

TENNESSEE - The 1955 light trap program was started during week ending March 9 with the placement of traps at 7 substations in following counties: Shelby, Madison, Lawrence, Maury, Robertson, Cumberland, Knox and Greene. Insects caught during the week are as follows: *Caenurgina erechtea* in small numbers from all reporting stations, *Hylemya cilicrura* and *Agonoderus* sp. in small numbers at most stations, one *Agrotis ypsilon* in Madison County, 1 each of *Peridroma margaritosa* in Shelby and Maury Counties. (Dozier, Stanley).

ARKANSAS - At Stuttgart, 7 *Pseudaletia unipuncta* and 4 *Agrotis ypsilon* adults taken March 5-10. At Fayetteville, 7 *P. unipuncta* taken March 10. (Warren).

RECENT IMPORTANT INTERCEPTIONS AT PORTS OF ENTRY

Living larvae, identified as *Epicaerus* sp. prob. *cognatus* Sharp, the so-called "picudo de la papa" (potato weevil) were intercepted recently in potato tubers from Mexico in baggage at Nogales, Arizona (Wilson) and in ships' stores at Houston, Texas (Ward). This insect has been reported a serious pest of potatoes in parts of Mexico. Potato plantings particularly in the mountainous districts are said to suffer considerable annual injury from its attack. Injury to the potato is caused by the larvae tunnelling in the tubers in all directions. Extensive galleries are hollowed out that are partially filled with frass as the larvae develop to a size of approximately 15 mm. in length.

Observations on the biology of *Epicaerus cognatus* in Mexico indicate that the adults emerge from the soil in May. Eggs are deposited on the potato foliage between May and October. Eggs hatch in about 18-20 days and the newly hatched larvae drop to the soil, seek out and bore into potato tubers. The larvae feed in the tubers for 3-5 months, then leave the tubers to form earthern cells in soil where they overwinter. Pupation occurs in March. In experimental tests, adult weevils were found to oviposit during the third summer after 2 winters of hibernation in cracks in the soil or under leaves, or other debris. Adults feed on potato foliage.

Living larvae of this potato weevil have been intercepted on numerous occasions during recent years in potato tubers from Mexico at various ports. It is not known to occur in the United States. (Compiled by Plant Quarantine Branch)

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Weather Continued
Muskegon, Mich., and 68° at Hartford, Conn. On the 10th; 94° at Dallas, Tex., 89° at Meridian, Miss., and 88° at Montgomery, Ala. on the 11th; and 89° at Jacksonville, Fla. and 88° at Charleston, S. C. on the 12th and 13th. Temperatures for the week averaged much above normal in nearly all areas, except a few degrees cooler than usual in the Pacific Northwest. The plus anomalies exceeded 12° over most of the western and middle sections of the Great Plains.

Precipitation was light over the greater portion of the country, with no measureable amounts reported from the lower portion of the western Plains, the middle Great Plains, much of Missouri and southern Illinois, the middle Gulf coastal area, southern Georgia and most of Florida. Heavy amounts were generally limited to local areas near the Northeastern Border, northern sections of Indiana and Ohio, and along the north Pacific coast.

The warm weather generally caused considerable reduction in the snow cover, except in the Pacific Northwest. East of the Rockies snow still covers the ground in northeastern North Dakota, northern portions Wisconsin and Michigan, northeastern New York, and northern and central New England. The increases in Washington and Oregon amounted to as much as 2 feet in the Cascades. There is 164 inches of snow on the ground at White Pass, Wash., 157 inches at Government Camp, Oregon, and 102 inches at Soda Springs, Calif. (Summary Supplied by U.S. Weather Bureau).

SUMMARY OF INSECT CONDITIONS - 1954

MISSOURI

Reported by G. W. Thomas
and Stirling Kyd

The second and third year of drought and semi-drought conditions in Missouri severely reduced all crops to such a degree that it was impossible to get an accurate picture of the total insect damage to any given crop over the entire growing season. Several insects occurred in outbreak proportions over the State including grasshoppers, armyworms (2 broods), variegated cutworm, pea aphid, and garden webworm. Many other localized insect outbreaks occurred in many areas and on many crops.

Field Crop Insects (Corn Insects) - SEED-CORN MAGGOT (*Hylemya cilicrura*) appeared in very light infestations in late April in southeast area and gradually increased to peak during latter half of May. Heavily damaged fields were widely scattered over southern two-thirds of the State with heaviest damage in Saline County. One factor that tended to keep injury to a minimum was the large percentage of insecticidally-treated seed. SEED-CORN BEETLES(*Agonoderus lecontei*) were light to moderate causing considerable damage to corn, especially in river bottom fields in many areas; counts ranged from 0.01 to 4 beetles per linear foot of row. WIREWORMS(primarily *Melanotus*) were moderate to very severe locally in many areas. Damage from light to total destruction, necessitating replanting. CLAY-BACKED CUTWORM (*Agrotis gladiaria*) injury became evident early in May when high populations built up in southeast area resulting in moderate damage to total destruction of early-seeded corn. Scattered infestations were numerous over the State. Approximately 15,000 acres replanted as result of damage. BLACK CUTWORM (*Agrotis ypsilon*) infestations were generally light and scattered in southern half, but heavy damage occurred in areas of north Missouri. Counties suffering heaviest loss were Carroll and Atchison. Approximately 45,000 acres replanted at least once due to damage. CORN ROOT WEBWORM (*Crambus caliginosellus*) damage was less than previous two years; 3-7 percent reduction in stands in a few scattered fields.

CORN FLEA BEETLE (Chaetocnema pulicaria) counts averaged only 1 per plant. Lower populations aided by drought conditions reduced Stewart's disease to lowest point in last several years. ARMYWORM (Pseudaletia unipuncta), although not considered a primary pest of corn, caused heavy damage to many fields over the southern two-thirds of State. Probably 1500 to 2000 acres lost, although drought reduced value of lost acres to small amount. SOUTHERN CORN ROOTWORM (Diabrotica undecimpunctata howardi) root feeding injury was much heavier than past years over southern two-thirds, although the drought-stricken corn fields failed to show characteristic lodging. During July and August very heavy populations of adults appeared on tassels and silks; averaged 5-7 beetles per stalk in many fields central area. The primary area having trouble with NORTHERN CORN ROOTWORM (Diabrotica longicornis) is the northwest quarter, although light numbers occur over northern half of State. Heavy root feeding damage was confined to scattered, individual fields. During August, heavy numbers of adults, 3 to 30 per plant in many northwest fields caused considerable damage to silks.

Heavy migration of CHINCH BUGS (Blissus leucopterus) from small grains to corn occurred in late June and early July. Moderate to heavy injury resulted from high populations and drought conditions. Fall abundance survey showed practically all counties north of Missouri River with severe overwintering populations and 10 northeast counties with very severe populations. High numbers also in extreme southeast cotton growing area. Most of northern counties averaged 2,000 to 5,000 chinch bugs per square foot of bunch grass. Heavy CORN EARWORM (Heliothis armigera) infestations and damage in whorls occurred over the southern two-thirds of the State by late June. Succeeding generations damaged ears, 60-97 percent some areas, wherever drought allowed the formation of shoots. Average of 7.5 percent of the grain ruined by secondary fungi as a result of feeding. CORN SAP BEETLE (Carpophilus dimidiatus) damage was greatly reduced over past two years, probably due to the drought. There was again considerable evidence that this pest could and does damage ears without aid of corn earworm. GRASSHOPPERS (mainly Melanoplus differentialis, M. bivittatus and M. femur-rubrum) - General, heavy populations probably caused more damage to corn than all of the other corn insects combined.. Severe damage occurred from June through September over practically entire State. Heaviest injury confined to western half of State and along Missouri River. Due to the effects of drought on grain in heavily infested areas, the loss of corn by grasshoppers must be figured on forage and silage production. Adults varied from 4 to 30 per square yard in many fields resulting in loss from 5 percent to total destruction. EUROPEAN CORN BORER (Pyrausta nubilalis) first generation was lighter than usual except in extreme northwest counties where higher infestations occurred. The second generation was held in check by high temperatures except in the northern two tiers of counties and along the Missouri River bottoms where populations built rapidly. Late planted corn was very heavily attacked. Fall abundance survey showed average of 174 borers per 100 stalks in the northern two tiers of counties, average of 94 borers in the central area; average of 225 borers in extreme southeast area. The state mean for 18 comparable counties was 169 borers per 100 stalks, or a 112 percent increase over 1953. Drought held SOUTHWESTERN CORN BORER (Diatraea grandiosella) damage to minimum although girdled stalks ranged from 0.01 to 44 percent in field corn. First generation was relatively low but second spread rapidly northward and slightly eastward. From 10 counties infested in 1953, 15 additional counties were found infested in fall of 1954 and for the first time this important pest was discovered in the corn belt of Missouri. New counties infested in 1954 included Taney, Greene, Dallas, Polk, Cedar, Hickory, St. Clair, Benton, Henry, Bates, Johnson, Cass, Jackson, Clay and Platte. FALL ARMYWORM (Laphygma frugiperda) was light to moderate on corn. Damage to ear shanks resulted in 1 to 10 percent dropped ears in northern half of State. GARDEN WEBWORM (Loxostege similalis), during the last week of June, caused moderate to heavy damage to corn, especially along the Missouri River bottoms.

Legume Insects:
PEA APHID (Macrosiphum pisi) was very heavy on alfalfa during April in central, southwest, and northern areas. At peak of infestations counts ranged from 100-150 aphids per sweep. Parasites and predators failed to increase substantially until late April. Statewide, first cutting of alfalfa was reduced 25-40 percent. From 10-25 aphids per sweep in red clover in northern third in May. CLOVER LEAF WEEVIL (Hypera punctata) was light to heavy generally on red clover and to a lesser degree on alfalfa. Up to 7 larvae per crown in northern half of State. A fungus disease reduced populations during first half of April. VARIEGATED CUTWORM (Peridroma margaritosa) was moderate to heavy statewide on alfalfa, red clover and other legumes. From 1 to 12 larvae per square foot in alfalfa while red clover averaged 4-5 larvae per square foot. Damage to first cutting

and new growth of alfalfa and red clover ranged from 20 to 35 percent. Parasites remained generally low until early in June. DINGY CUTWORM (Feltia subgothica) was lighter than usual in some red clover fields, central area but still ranged from 2-5 larvae per square foot. CLOVER ROOT CURCULIO (Sitona hispidula) and SWEETCLOVER WEEVIL (Sitona cylindricollis) apparently now occur statewide and usually in conjunction at an estimated ratio of 10 S. hispidula to 1 S. cylindricollis. Peak population appeared June 8, however, damage to alfalfa and red clover was light. Soybeans near clover fields heavily damaged along margins by adults of S. hispidula, especially in St. Charles and Lafayette Counties. CLOVER APHID (Anuraphis bakeri) was light to moderate on red clover in May and November. POTATO LEAFHOPPER (Empoasca fabae) migrating adults were first discovered on alfalfa in extreme southeast Missouri April 20. Populations remained generally low throughout the season with the highest counts averaging 3-4 per sweep in alfalfa June 15. LESSER CLOVER LEAF WEEVIL (Hypera nigrirostris) was light to heavy generally on red clover over the northern half of State. Many fields had 90-98 percent of blossom and 45-60 percent bud and terminal injury. TARNISHED PLANT BUG (Lygus lineolaris) populations remained generally low over State until late fall when increased on alfalfa and red clover. Average of 4-6 per 10 sweeps during the fall. GREEN CLOVERWORM (Plathypena scabra) third generation built to high numbers on soybeans especially in the east central area where larval counts averaged 4-7 per linear foot of row. Foliage injury to soybeans was moderate to heavy. GRASSHOPPERS caused heavy damage to alfalfa, red clover and soybeans over State except extreme southeast and northeast. Counts ranged from 5 to 55 per square yard and damage from 10 percent to total destruction. GARDEN WEBWORM damage to soybeans ranged from 10 to 50 percent defoliation and on alfalfa from 10 percent to total destruction of two midseason cuttings. From 1 to 45 larvae per linear foot of soybean row and from 1 to 28 per square foot of alfalfa. Parasites remained generally low.

CORN EARWORM on alfalfa and soybeans reached peak in late September. Counts on alfalfa ranged from 1-10 larvae per 10 sweeps and from 0.1 to 1 larva per linear foot of soybean row. Damage to soybeans was largely confined to the pods and ranged from 1 to 20 percent. Heavy overwintering populations of BEAN LEAF BEETLE (Cerotoma trifurcata) damaged germinating soybeans in southeast. Second and third generation adults continued to cause damage through September.

Considerable injury to blossoms, small pods and beans occurred in extreme southeast area. Counts at peaks of all generations would range from 1-7 per linear foot of row. During September, scattered heavy infestations of TWO-SPOTTED SPIDER MITE (Tetranychus bimaculatus) appeared on soybeans in southeast and central areas.

Grain Sorghum Insects:
CORN LEAF APHID (Rhopalosiphum maidis) was heavy over State but damage apparently very light. CHINCH BUGS were moderate to heavy in all areas except southwest during the fall, averaged 10-15 per plant in southeast and north Missouri. FALSE CHINCH BUGS (Nysius spp.) were light to heavy, 100-200 per head some fields, during early September in southern half of State. Extent of injury not known. SOUTHERN CORN ROOTWORM caused light damage to heads in September and October. GRASSHOPPERS (Melanoplus crop spp.) caused light to moderate damage to both foliage and heads generally over western half of State. Loss of 7-10 percent of grain in heavily infested fields. Near the middle of September, CORN EARWORM heavily attacked heads. In the central area, many fields averaged 2 to 4 larvae per head. Approximate 7 percent grain loss.

Pasture Insects:
From 1 to over 100 CLAY-BACKED CUTWORMS in May in Howell County, lighter numbers scattered over southern area. Light to total destruction of pastures observed. VARIEGATED CUTWORM was moderate to heavy, 1 to 9 per square foot, in bluegrass and other pastures. Pastures in extreme southeast, central and northwest areas had light to heavy damage by the first brood ARMYWORMS. Third generation in late August caused heavy damage to fescue in central and northwest areas, counts from 3 to 33 per square foot. Bluegrass pastures in northwest and to a lesser degree in the central area were damaged by BRONZED CUTWORM (Nephelodes emmedonia). BLUEGRASS WEBWORM (Crambus teterrellus) was light to heavy generally over northern two-thirds of State. Heaviest damage in extreme northwest area where average counts were 6-10 larvae per square foot. LEAFHOPPERS . . became very abundant in the ranker pastures during late April and May. Damage light to moderate. GRASSHOPPERS, for the third consecutive year, caused more damage to pastures than all other insects combined and damage would nearly equal that of drought. From June to October, populations varied from 3 to 30 or more per square yard over State except in extreme southeast and northeast corners. Carrying capacity of pastures was reduced at least 30 to 40 percent.

Small Grain Insects:

The 1954 ARMYWORM outbreak was more general and heavier than in 1953. Migrating moths first appeared in extreme southeast area during the first week of April, heavy flights in central area by April 8-10. Moderate to heavy damage was general over southern two-thirds of the State and in scattered areas in northeast and northwest corners. Average field counts from 5 to 30 larvae per square foot. Barley was more heavily damaged followed by rye, wheat and oats. An estimated 50,000 acres of small grains with a value of $2,132,000 were lost to the first generation. An estimated 300,000 acres were sprayed resulting in a saving of $6,500,000. Temperatures kept parasites in check until outbreak reached northern third of State and then they built rapidly. Early in August, heavy populations were present in all vegetation that had escaped the drought with counts ranging from 3 to over 100 larvae per square foot. Parasites were heavy and generally kept infestations under control although many fields of volunteer oats were completely destroyed. This third brood outbreak marked the first time that true armyworms have been a fall problem in Missouri. Sporadic moth flights continued until near middle of November and small, overwintering larvae found in very limited numbers in volunteer grains and bunch grass.

FALL ARMYWORM, for some unexplained reason, was very light in small grains over State. HESSIAN FLY (Phytophaga destructor) infestations and damage lowest in past several years. Stubble survey in July showed Pettis and St. Charles Counties to be the only counties with more than a 2 percent infestation while State average was just under 1 percent. WHEAT JOINTWORM (Harmolita tritici) stubble survey made in July revealed average of just under 1 percent for 22 counties surveyed, with St. Charles County having 5.5 percent infestation. ENGLISH GRAIN APHID (Macrosiphum granarium) damage was slight to rye and wheat. LEAFHOPPERS (especially Macrosteles fascifrons) built up in heavy numbers on small grains over the southern two-thirds of the State. Feeding caused extensive yellowing of the blades. GRASSHOPPERS damaged heads of small grains in western areas. In southwest and west central areas from 5 to 10 percent of the ripening oat heads were cut.

Cotton Insects :

THRIPS were somewhat more numerous over the area than in 1953 although damage was not significant. TWO-SPOTTED SPIDER MITE was light to moderate in July in scattered fields.

COTTON FLEAHOPPER (*Psallus seriatus*) more common over area than during past years, although very few fields had sufficient populations during early season square formation to warrant spray applications. Counts averaged 8 to 11 nymphs and adults per 100 terminals. BOLL WEEVIL (*Anthonomus grandis*) - Survival of overwintering population was very low although areas in Ripley, Butler and Dunklin Counties had June infestations of 2 to 10 percent. Drought and high temperatures generally held second generation in check. Late season migration was mostly light to moderate. Late in August, as corn dried out, BOLLWORMS built up considerably on rank cotton, especially in New Madrid and Stoddard Counties. In most fields maturity of bolls prevented heavy damage although low spots lost from 5 to 10 percent. At the peak of infestation, counts in rank fields would average from 7 to 17 eggs and 3 to 5 small larvae per 100 terminals. Parasites and predators were numerous in all fields. Forty thousand to fifty thousand acres were sprayed of which probably not more than ten thousand was justified. Light infestations of COTTON LEAFWORM (*Alabama argillacea*) were discovered in a small area of Stoddard County September 1. The following insects were also of some importance on cotton in 1954: black cutworm, yellow-striped armyworm, variegated cutworm, seed-corn maggot, cotton aphid and rapid plant bug.

Fruit Insects:
CODLING MOTH (*Carpocapsa pomonella*) situation was about normal; however, good commercial control was obtained. FLATHEADED APPLE TREE BORER (*Chrysobothris femorata*) - In plantings of young apple trees, infestations and damage was very severe in several areas. GRASSHOPPERS caused severe damage to planting of young apple trees, especially in the southern two-thirds of State. During July and August, grapes in the south central area had moderate to heavy damage by the insects cutting off bunches of grapes. TWO-SPOTTED SPIDER MITE infestations were scattered, moderate to severe in all areas. RED-BANDED LEAF ROLLER (*Argyrotaenia velutinana*) was not a problem except in southwest corner where irrigated orchards had 6 percent of total crop injured by the third brood. PLUM CURCULIO (*Conotrachelus nenuphar*) infestations and damage spotted. In south and central areas considerable feeding injury by adults of second brood on apples and peaches. PEACH TREE BORER (*Sanninoidea exitiosa*) - Several orchardists ran into borer problems due to use of mist blowers which resulted in severe buildup because they failed to get enough insecticide on trunks and bases of peach trees. STINK BUGS caused moderate

to heavy damage to peaches, principally in the northeast area during middle of drought period. GREEN JUNE BEETLE (Cotinis nitida) adults were a problem on ripening early peaches and grapes in scattered areas. GRAPE FLEA BEETLE (Altica chalybea) caused moderate to heavy damage in a few vineyards in south central area. Scattered vineyards over the southern half of the State had moderate to severe damage during late April from CLIMBING CUTWORMS destroying the swelling buds.

Stored Product Insects:
Hot, dry weather of summer and fall kept both primary and secondary stored grain insects at a minimum over much of the State. RICE WEEVIL (Sitophilus oryza) - Light to moderate fall infestations common in the west central area in wheat, barley, oats and corn. BRAN BEETLES (Tribolium confusum and T. castaneum) were generally moderate to heavy in all farm-stored grains. FLAT GRAIN BEETLE (Laemophloeus pusillus) occurred in moderate numbers in farm-stored grains of St. Charles County. SAW-TOOTHED GRAIN BEETLE (Oryzaephilus surinamensis) was light to heavy in farm-stored grains in most areas. ANGOUMOIS GRAIN MOTH (Sitotroga cerealella) - Populations lowest in past several years although light infestations were common in stored corn. Fall field infestation of corn was extremely light. CADELLE (Tenebroides mauritanicus) infestations were lighter than normal. INDIAN-MEAL MOTHS(Plodia interpunctella) were light to moderate, but much less than in 1953. GRAIN MITES were common in farm-stored grains. PSOCIDS were moderate to heavy on all farm-stored grains during late summer and early fall. VINEGAR GNATS (Drosophila spp.) - Ripening fruits and vegetables became heavily infested over State during early fall. Adults became a nuisance in many farm homes. SILAGE MAGGOTS, Chrysomyza demandata occurred generally and in heavy numbers in the rotting marginal areas of trench silos. A soldier fly maggot (probably Hermetia illucens)occurred in heavy numbers over scattered areas of the southern half of State in trench and upright silos.

Forest, Shade and Wood Product Insects:
OAK TIMBERWORM (Arrhenodes minutus) - 78 percent of 164 oaks blazed in May in the Ozark region were attacked by this species. Lumber sawed from pinworm injured trees is either rejected as cull or degraded. LESSER CARPENTERWORM (Prionoxystus macmurtrei)was found to attack, via blazes, a number of oak trees in the Ozark region.

Various BORING INSECTS and decay make it necessary to discard roughly 50 percent of the oak felled each year in logging operations in Missouri, and in addition there is considerable loss due to degrading of borer injured lumber. Many of the hardwood shade and forest trees over southern two-thirds of State moderately to heavily damaged by FLATHEADED APPLE TREE BORER. Pecan groves in extreme southeast area more heavily infested than ever. POWDER POST BEETLES (Lyctus spp.) - Handle mills throughout Ozark region report increasing and heavy damage to natural and finished products. Oak subflooring and flooring, especially in southern areas, becoming more commonly infested than in recent years. NANTUCKET PINE MOTH (Rhyacionia frustrana) infestation lighter than in 1953 in the central area, however, heavier in the southeast quarter of State. Several pine plantings for Christmas trees were 90 to 99 percent tip infested by first-generation larvae, although second generation was very light in same plantings. RED-HEADED PINE SAWFLY (Neodiprion lecontei) caused heavy, localized damage to several pine plantings in Washington, Franklin and Crawford Counties. SMALLER EUROPEAN ELM BARK BEETLE (Scolytus multistriatus) - Three consecutive years of drought have severely injured elms allowing tremendous buildup and damage to all native elms over much of the western half of State. Estimates of elm tree losses in the southwest quarter of the State made in early fall indicate 50-60 percent of red elm and 25-35 percent of white elms killed. During late May and June, tremendous populations of APHIDS were present on oaks, hickory, elm, maple and other forest trees over the southern half of the State. Extremely high populations of lady beetles built up in June and greatly reduced aphid numbers. During high temperatures in July, concentrations of lady beetles 6 to 12 inches deep were present under trees on points of high elevation in the Ozark region. OAK KERMES SCALES (Kermes spp.) - Several species of oaks lightly to heavily infested in southern area with extreme southeast being heaviest. Trees in latter area had from 10 to 80 percent of the new terminal growth killed.

TWIG PRUNERS (especially Hypermallus villosus) - Rather heavy increase in girdled or fallen twigs noted during the season on many species of forest and shade trees. GRASSHOPPERS (largely Melanoplus differentialis) damaged shrubs, shade and forest trees heavier than in 1953 over much of southwest and central Missouri. Defoliation from 5 to 100 percent with small trees, shrubs and especially multiflora rose fences being most heavily damaged. ELM LEAF BEETLE

(*Galerucella xanthomelaena*) was heavy and caused more widespread injury to Chinese, and to a lesser extent, native elms over much of extreme southeast Missouri. Infestation has spread northward along the Mississippi River to St. Louis. GREEN-STRIPED MAPLE WORM (*Anisota rubicunda*) damage much less than in 1953, although localities in central and northwest Missouri had total defoliation of soft maples. WALNUT CATERPILLAR (*Datana integerrima*) damage much less than in 1953, although scattered areas in southwest and west central Missouri were from 30 to 95 percent defoliated. FALL WEBWORM (*Hyphantria cunea*) infestations were scarce. MIMOSA WEBWORM (*Homadaula albizziae*) - A single infestation was discovered at Caruthersville in Pemiscot County marking the first record of this pest for Missouri.

SURVEY METHODS

A Technique for a Rapid Determination of European Red Mite Populations on Foliage

By O. H. Hammer

The time required for determining European red mite (Metatetranychus ulmi) populations is one of the most important limiting factors in carrying out field tests for the control of this pest. Since populations are subject to rapid fluctuations due to tremendous reproductive capacity, weather conditions, and intermingling of late broods, it is desirable to make population determinations for any given series of tests during as short a period of time as possible.

This report is a discussion of a technique used at the Dow Agricultural Chemical Research Field Station at South Haven, Michigan, since 1942. This discussion deals with studies made on mite populations on apple, cherry, prune, plum, peach and other foliage.

Determination of Mite Populations

Sampling: A more accurate appraisal of the effectiveness of mite treatments may be made if the mite population of each plot immediately precedingapplication is known. Such information is important for the checks as well as for those that are to be treated. This is desirable since large differences often exist between populations in the various plots within a planting.

The pre-treatment and post-treatment population determinations are made from samples of 50 leaves from 2 to 5 trees in each plot. The number of leaves taken from each tree is determined by the number of count trees in the plot. For example, if 5 trees are used, they are marked and ten leaves are taken from each tree at each collection. If 3 trees are used 16 leaves are taken from one tree and 17 from each of the other two. The leaves are all taken by the collector circling the tree and picking the samples at regular intervals so that a complete circle is made while sampling each tree. Leaves are taken from wood with a diameter of 3/4 to 1 inch and usually at arm's length from the perifery of the trees. In the case of heavily infested trees it is necessary to make leaf collections near the tips of branches as the mites move out. These leaves are dropped immediately into small containers in a "lethal chamber" shown in Figure 1. All leaves from a plot are put into one receptacle. This receptacle may be of any suitable size. One quart cylindrical paper ice cream containers have proved satisfactory, although slightly larger containers may be more suitable when the leaves are very large such as are sometimes encountered on Duchess, Baldwin, Greening, and other varieties. An identifying card is placed on the leaves in the receptacle.

Killing the Mites : Difficulty is sometimes encountered while making population counts of live mites. When the leaves are heavily populated and when counts are made at high temperature, the active forms move about rapidly, many running off the leaves or shifting from one side of the leaf to the other. These difficulties have been overcome by placing the leaf samples immediately into the small containers which are carried in the "lethal chamber" mentioned above. The chamber is simply a tight container of a size suitable for carrying about the orchard. (Figure 1). It is constructed of a wooden frame covered with pressed wood. A 2-3/4" opening is cut in the cover over each container. These holes are snugly fitted with plugs which are merely lifted and replaced each time a leaf is dropped into the receptacle. An interior view of the lethal chamber is shown in Figure 2. On the lower surface of the chamber lid, provision is made for use of the lethal chemical. In the case illustrated, this consists of fastening to the lid strips of absorbent cotton wrapped with cloth to prevent fraying. Excellent results for quick kill of the active mites have been obtained by the use of propylene or ethylene dichloride. One application of a few ml. of the liquid toxicant per cubic foot of space is sufficient to give quick killing during the time required to collect fifty leaves from each of six plots. Ethylene and propylene dichloride serve very well for this purpose since they are relatively safe to the collector when used out of doors, and also indoors by observing reasonable precautions. The liquid should be charged into the cotton often enough to cause discoloration of the leaves within 20 minutes. To further insure kill of the mites the sample filled receptacles may be stored in larger lethal chambers. (Figure 3). A large number of plots may be sampled in this way within a few hours. The samples may be stored in the receptacles in a cool moderately humid place (60-80 % relative humidity) or the mites may be removed from the leaves and stored on the glass plates in a similar place until counts are made. Counts should be made as soon as possible, however.

Preparing for and Making Actual Counts: After the leaf samples have been collected, the mites killed and taken to a central station, the next step is to remove the mites from the leaves. This is done with a machine developed by C. F. Henderson of the U. S. Department of Agriculture working with the citrus mite (Metatetranychus citri) in California. The details of this machine and its operation are discussed in U. S. D. A. Circular 671, 1943. The method of operation was very similar to that described by Henderson. For the purpose of this report pertinent items and slight alterations in procedure are briefly discussed. The machine (Figure 4) consists essentially of two three-quarter inch rotary brushes, four inches long, mounted close together in a horizontal position and above a metal turn table. The brushes found most satisfactory for use on mites are of goat's hair. The brushes and turn table are operated by a small electric motor. The motor in this case is described as follows: H. P. 1/175, volts 115, cycles 60, amps 38 and rpm 1500. A 6-volt motor may be used if it is desired to use the equipment in the field where the motor can be powered from a storage battery. The turn table on the brushing machine is a metal plate which holds a glass disc of the proper size. During the brushing process the leaf samples are inserted between the rotating brushes and the mites and the eggs are dislodged. Two metal shields extend from slightly above the top of the brushes, downward to the glass disc on the turn table. These shields serve to confine the falling mites to the disc below. For maximum removal of mites, it has been found advisable to insert one end of the leaf between the brushes, withdraw it, and then insert the other end. If removal of all the eggs is desired, further brushing may be necessary after the leaf has been folded to fully expose the midrib. The glass disc placed on the turn table during the brushing process should have a diameter 1/4 - 1/2 in. greater than that of the area within the shields. This will permit handling the glass without crushing the forms collected thereon. Immediately before placing the glass disc on the turn table the upper surface should be lightly coated with thin varnish or some other suitable adhesive. The falling mites and eggs will lodge and remain on this film during subsequent handling. The rotation of the disc during the brushing process insures a fairly uniform distribution of the mites and eggs over the coated surface.

The regular laboratory equipment plus a few easily made accessories are all that is needed to make the counts. (Figures 5 and 6). The glass disc containing the mites and/or eggs is placed on a holding board which facilitates manipulations of the disc when put into position for examination with a binocular microscope. In making the counts, one of two means of guiding the observer during the counting is used, depending upon the abundance of specimens on the disc. If only a few are encountered, the holding board with parallel fields as shown on the left in Figure 6 is used and all specimens are counted. If there are many mites, the holding board with the black and white cardboard disc as shown on the right in Figure 6 is used and only those which lie over the white areas are counted. The narrow white stripes are for guides only and mites lying over them are not counted. The total white area is 25 percent of the total specimen bearing area. (Henderson 1). Thus the number of forms counted in this way, multiplied by 4 gives a figure approximately the same as if the entire area is counted. When making the counts one light source, namely a microscope lamp with the light beam directed to the field of observation has proved adequate. This is different and somewhat simpler than the illumination described by Henderson. It may be that certain conditions, not yet encountered in this work, will require the setup described by him.

Enough time is allowed between the application of control treatment and leaf sampling to cause the treatment-killed mites to dry and shrivel. The first sampling after treatment is usually 3 to 5 days. If heavy rains occur during this interval many of the dead mites will be washed from the leaves. If properly handled, as described earlier, the mites which escaped the treatment, but which were killed in the lethal chamber will remain plump and may be easily identified as "live mites." Only live mites are counted.

After the counts are made the glass discs may be cleaned by immersing in a strong solution of trisodium phosphate, after which they may be rinsed in water, dried and used again.

LITERATURE CITED:

(1) Henderson, C.F. and McBurnie, H.V. 1943. Sampling Technique for determining populations of the Citrus Red Mite and its Predators. U.S. Dept. Agr. Circ. 671.

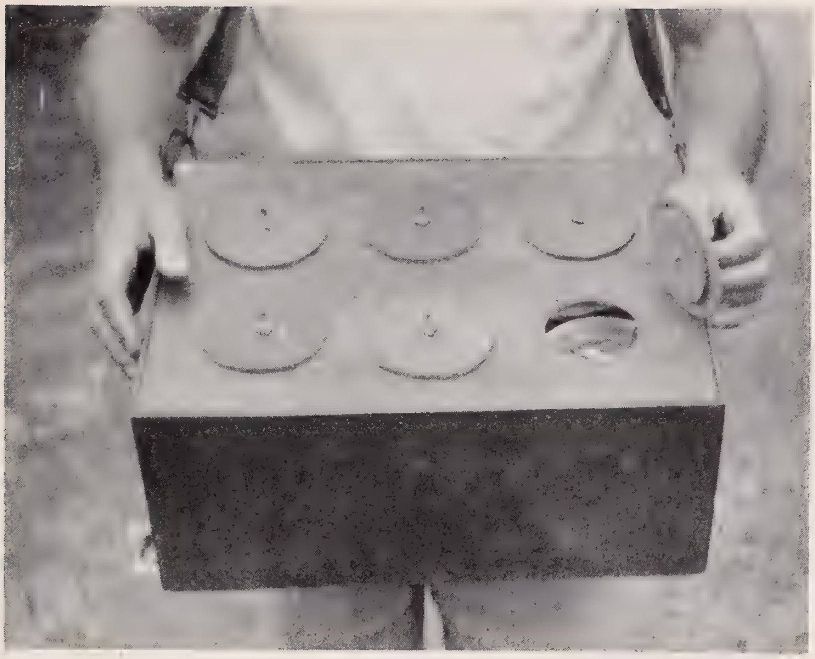

Figure 1. Details of collection chamber lid with one plug removed.

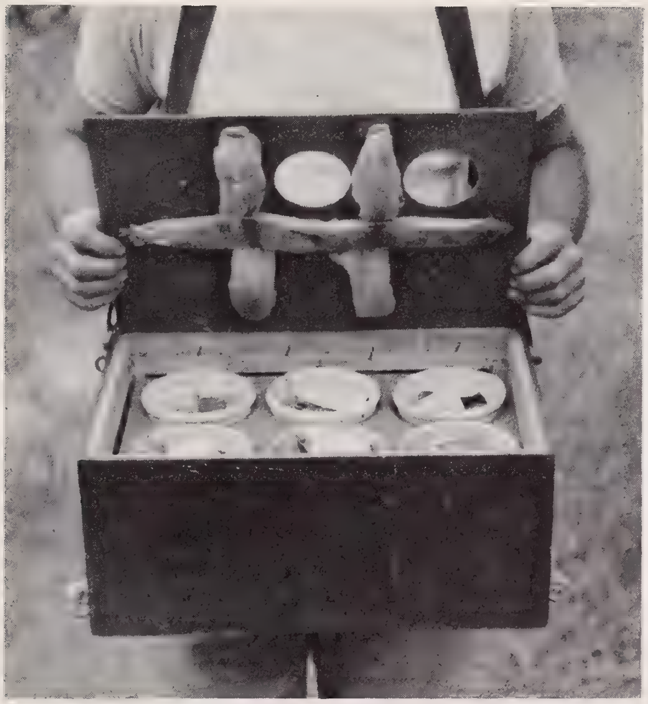

Figure 2. View of interior of collection chamber with samples from six plots in the six cardboard receptacles. Strips of absorbent material for fumigation may be enclosed in window screening to avoid fraying.

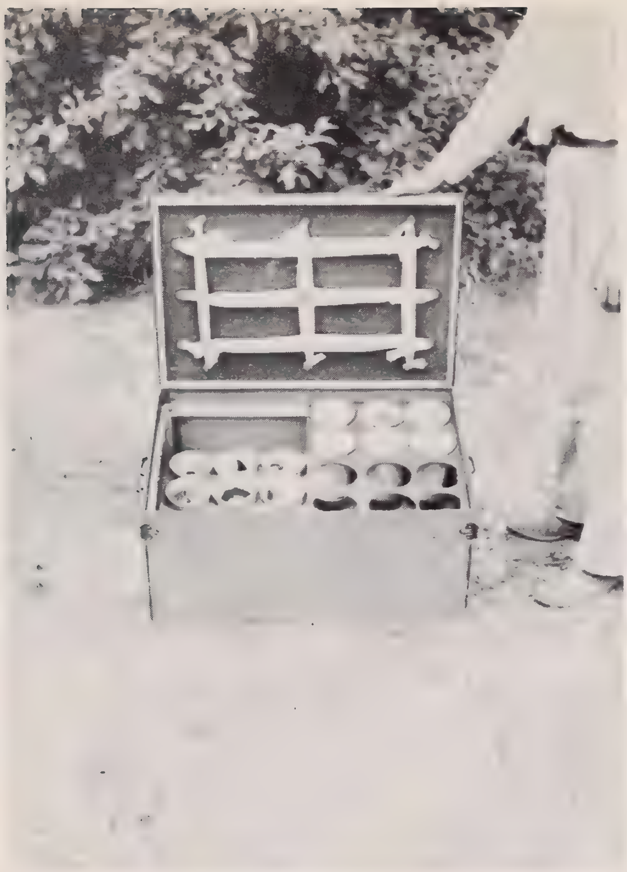

Figure 3. Chamber for transporting samples and for further fumigation and storage if necessary.

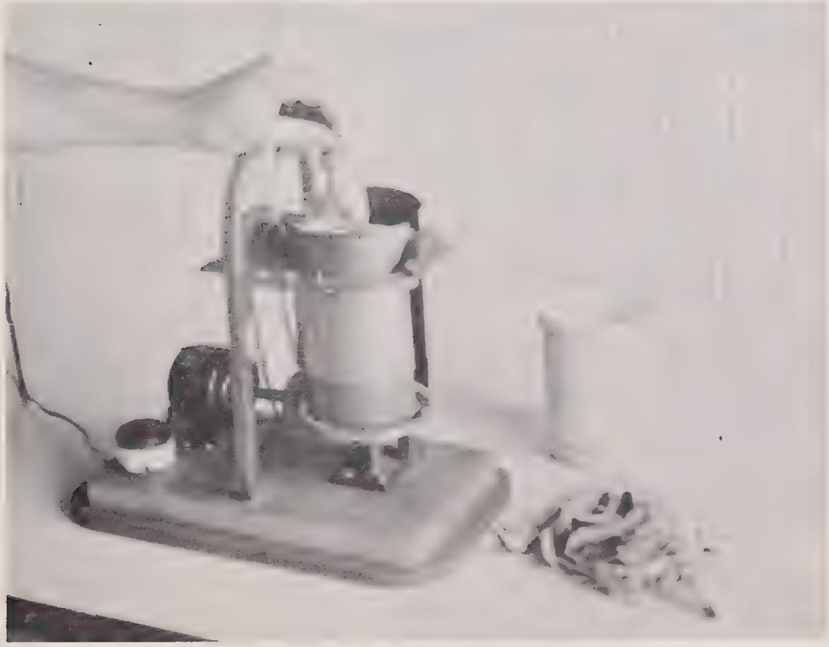

Figure 4. Brushing machine with leaf being inserted between brushes.

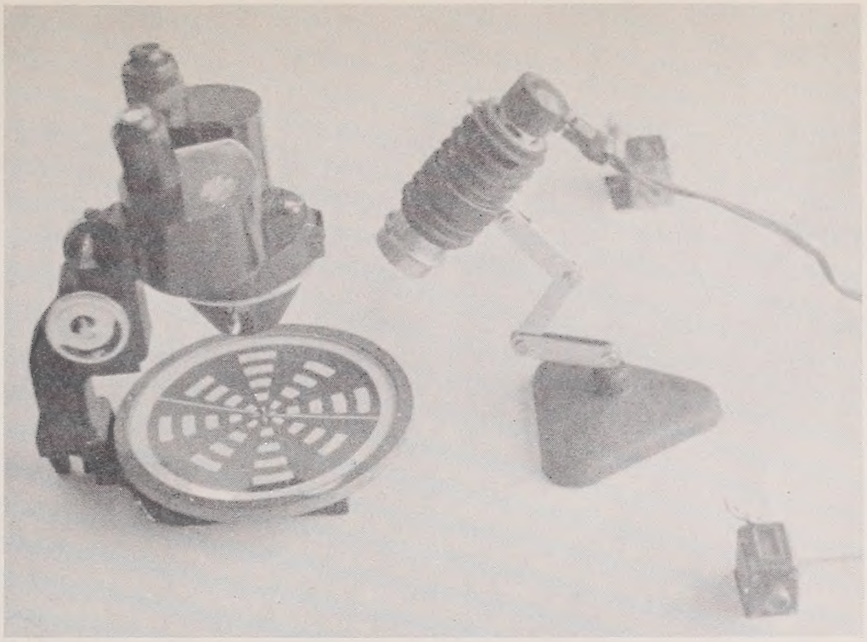

Figure 5. Equipment used for making counts. The tallies are mounted on the table top and manipulated by pressing, with the knees, levers under the table which are connected to the tally levers by strings.

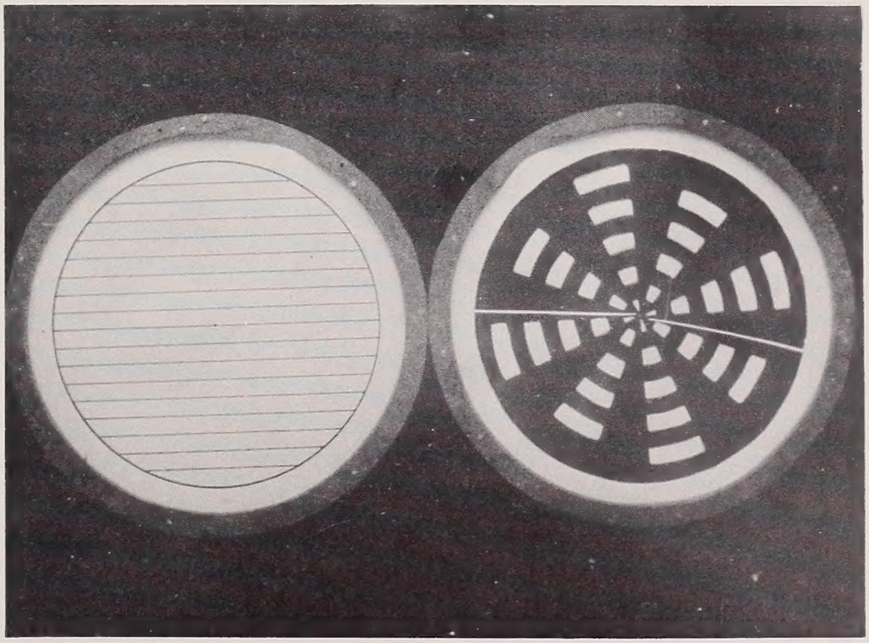

Figure 6. Holding board for easy manipulation of glass discs containing specimens. Left, parallel areas for inspection in case of light infestation. Right, white areas for inspection in case of heavy infestation.

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